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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,145	01/22/2002	Malcolm Mosher JR.	9806-0037-999	2350

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EXAMINER

LE, DEBBIE M

ART UNIT PAPER NUMBER

2177

DATE MAILED: 05/20/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

10/056,145

Applicant(s)

MOSHER ET AL.

Examiner

DEBBIE M LE

Art Unit

2177

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

Claim 18 is objected to because of the following informalities:

In line 20, page 31, the acronym name "TMF" is not defined in the claim.

Applicants is required to spell out .

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-22 are rejected under 35 U.S.C. 102(e) as being anticipated by  
Holenstein et al (USP Application 2002/0133507 A1).

As per claim 1, Holenstein discloses a data replication system having a primary computer system (fig. 2a, # 12, primary replication) and a backup computer system (fig. 2b, # 24, standby/reverse replication), a method of lock-step replication of database updates that occurred in the primary computer system to the backup computer system

(changes to the source database are lock-stepped with the changes to the target database, ¶ 0008), the method comprising:

within a first application executing on the primary computer system: performing and completing a first transaction on the primary computer system (ready to be committed), the first transaction updating a first file in the primary computer system (ready to commit stage are paused, ¶ 0102);

in the primary computer system, upon completing the first transaction, initiating a lockstep transaction that updates a second file in the primary computer system (RTC tokens to ensure that the appropriate rows in each target table are locked before a transaction is committed at the originating node, ¶ 0105); and

waiting to receive a predefined message prior to performing any further operations (When an RTC token is received back (returned) from each of the other nodes in the system 44, then the originating node knows that all of the other nodes in the system 44 have locked the appropriate rows and are ready to commit the transaction, ¶ 0105);

sending audit records from the primary computer system to the backup computer system, the sent audit records including audit records representing the updates to the first file by the first transaction and the updates to the second file by the lockstep transaction (the transaction is started by local input device A at node A and is replicated at node B. At time t1, the local application program A begins transaction 101. The audit trail A thus includes an entry for this step. The BEGIN step is replicated to node B and thus appears in the audit trail B shortly thereafter, ¶ 0108);

receiving from the backup computer system confirmation that the audit records representing the updates to the first file by the first transaction and the updates to the second file by the lockstep transaction have been durably stored by the backup computer system, and upon receiving said confirmation, sending the predefined message to the first application (engine at a second node determines whether a target database at the second node is prepared for a commit operation for the transaction corresponding to the ready to commit token, and, if so, sends back the ready to commit token to the first node, ¶ 0152, ¶ 0110).

As per claim 2, Holenstein teaches wherein the lockstep transaction is initiated by a procedure call made immediately upon completion of the first transaction (¶ 0109).

As per claim 3, Holenstein teaches wherein the first application performs an operation dependent upon completion of the first transaction only after receiving the first predefined message (¶ 0111—0112).

As per claim 4, Holenstein teaches upon occurrence of a pre-determined event that terminates the lockstep transaction (row locks for A and B nodes are removed/deleted after the commit step is completed, ¶ 0113), initiating a second lockstep transaction that updates the second file in the primary computer system (as communicates with the RTC table regarding which transactions are waiting to commit and which transactions can go forward with a commit step, ¶ 0112. In other words, when the system verifies that the transaction may be committed without a possibility of a collision; therefore, transactions can go forward, ¶ 0107. It would be understood that Holenstein's system is avoided collision in a bi-directional database replication, so when

transactions are ready going forward (§ 0102), initiating a lockstep is always applied to transaction before a transaction is committed, § 0105);

after the second lockstep transaction is initiated, sending audit records from the primary computer system to the backup computer system, the sent audit records including audit records representing the updates to the second file by the another lockstep transaction; after the second lockstep transaction is initiated, ignoring said confirmation that the audit records representing the updates to the first file by the first transaction and the updates to the second file by the lockstep transaction have been durably stored by the backup computer system; after the second lockstep transaction is initiated, receiving a second confirmation that the audit records representing the updates to the second file by the second lockstep transaction have been durably stored by the backup computer system, and upon receiving said second confirmation, sending the predefined message to the first application (these limitations are just repeating the steps which have been addressed in independent claim 1 start from "sending audit records from the primary... sending the predefined message to the first application"; therefore, they are rejected under the same rationale as state in independent claim 1 arguments).

Claim 5 is rejected by the same rationale as state in independent claim 1 arguments. Moreover, Holenstein teaches the lockstep audit record having a first transaction identifier (the indicia is the transaction identifier, § 0109); reading audit records stored in the audit trail in a sequence in which the audit records are stored (each RTS is transmitted in sequence, § 0123, § 0132); transmitting the audit record to

the backup computer system (§ 0026), wherein the backup computer system includes mechanism for safely storing the lockstep audit record...is safely stored (transaction have been safe stored at all nodes, § 0134).

As per claim 6, Holenstein teaches storing the first transaction identifier at a first location of a pre-defined data structure (the local application program enters an indicia of transaction 101 into the RTC table A, flag is set for the table entry, § 0109, § 0114); and during the reading step and upon encountering the first lockstep audit record, extracting an audit trail position and a transaction identifier from the first lockstep audit record; storing the extracted audit trail position at a second location of the pre-defined data structure; and storing the extracted transaction identifier at a third location of the pre-defined data structure (fig. 1, § 0025).

As per claim 7, Holenstein teaches comparing the safe audit trail position to the audit trail position stored at the second location; and comparing the transaction identifier stored at the first location and the transaction identifier stored at the third location (compare the before and after value extracted from the transaction audit trail, transaction the caused the collision can be identified by comparing a unique record indicia, § 0221, § 0266).

As per claim 8, Holenstein teaches upon occurrence of an event that disrupts the lockstep replication procedure before completion (indicate that a collision will occur if the transaction goes forward, § 0107), performing another lockstep transaction, the another lockstep transaction having a new transaction identifier (§ 0102, lines 16-21); and storing the new transaction identifier in the first location of pre-defined data

structure (a flag value equal to 1 to prevent RTC tokens from being generated more than one time for each unique transaction identifier, ¶ 0114) such that the checking step results in a mismatch between the transaction identifier stored at the first location and the transaction identifier stored at the third location (a failure is detected that indicative of a potential collision for the transaction, the transaction is restarted, ¶ 0040, ¶ 0134, the flag is initially set to zero, a token is generated for each new RTC table entry, ¶ 0109, ¶ 0124).

As per claim 9, Holenstein teaches pausing execution of an application program upon initiation of the lockstep replication procedure and resuming execution of the application program upon completion of the lockstep replication procedure (transaction may be paused to wait for a return of the RTS token from all nodes, ¶ 0132).

As per claim 10, Holenstein teaches wherein the transmitting step comprises transmitting at least a subset of the audit records to the backup computer system in a message buffer (memory cache to hold information about the transaction steps and operations, ¶ 0051), and wherein the backup computer system is configured to return an audit trail position of a last saved audit record as the safe audit trail position without ensuring the audit records of the message buffer are durably stored unless the lockstep audit record is included in the message buffer (¶ 0028, ¶ 0150-0152).

As per claim 11, Holenstein teaches initiating a first lockstep replication procedure and performing a first update on a pre-determined file in the primary system (RTC tokens to ensure that the appropriate rows in each target table are locked before a transaction is committed at the originating node, ¶ 0105), the first update being



identified by a first unique transaction identifier (the indicia is the transaction identifier, ¶ 0109, unique transaction identifier, ¶ 0114);

storing the first unique transaction identifier in a pre-defined data structure in the primary system as a lockstep gateway transaction identifier (LockStep\_Gateway\_TID) (the local application program enters an indicia of transaction 101 into the RTC table A, ¶ 0109 );

generating audit records that indicate database updates pertaining to database transactions performed on the primary system, the audit records further including a first lockstep audit record that is associated with the first update on the pre-determined file and that includes the first unique transaction identifier; storing the audit records in an audit trail in the primary system (an audit trail, its purposes to hold information about the transaction steps and operations, ¶ 0051);

extracting audit records from the audit trail for transmission to the backup computer system; storing an audit trail position of the first update in the pre-defined data structure upon encountering the first lockstep audit record during the extracting step; storing the first unique transaction identifier in the pre-defined data structure as a lockstep audit transaction identifier (LockStep\_Audit\_TID) upon encountering the first lockstep audit record during the extracting step (¶ 0025); transmitting the stream of audit records and a lock-step indicator to the backup computer system (¶ 0026), wherein the lock-step indicator indicates a lockstep replication procedure has initiated, wherein the backup computer system is configured to ensure the stream of audit records are durably stored upon receiving the lock-step indicator, and wherein the

backup computer system is configured to transmit to the primary computer system a safe position indicating the audit trail position of durably stored audit records upon receiving the lock-step indicator (§ 0134);

comparing the safe position returned by the backup computer system to the audit trail position stored in the pre-defined data structure; and indicating completion of the lockstep replication procedure when the safe position is equal to or higher than the audit trail position stored in the pre-defined data structure and when the lockstep gateway transaction identifier (LockStep Gateway\_TID) matches the lockstep audit transaction identifier (LockStep\_Audit\_TID) (compare the before and after value extracted from the transaction audit trail, transaction the caused the collision can be identified by comparing a unique record indicia, § 0114, § 0221, § 0266).

Claims 12, 16 and 19 have similar limitations as claim 9; therefore, they are rejected under the same subject matter.

Claims 13 20-21 have similar limitations as claim 8; therefore, they are rejected under the same subject matter.

Claims 14, 17 and 22 have similar limitations as claim 10; therefore, they are rejected under the same subject matter.

Claim 15 is rejected by the same rationale as state in independent claim 11 arguments. Moreover, Holenstein teaches upon an occurrence of an event that disrupts operations of the primary computer system (indicate that a collision will occur if the transaction goes forward, § 0107), performing the steps of: performing a second update on the pre-determined file in the primary system, the second update being identified by

a second unique transaction identifier, replacing the first unique transaction identifier with the second unique transaction identifier in the pre-defined data structure (§ 0114).

Claim 18 is rejected by the same rationale as state in independent claims 11 and 15 arguments. Moreover, Holenstein teaches s TMF module configured to generate audit records (Compaq Transaction Monitoring Facility (TMF), § 0056-0059).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DEBBIE M LE whose telephone number is 703-308-6409. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN BREENE can be reached on 703-305-9790. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



DEBBIE M LE  
Examiner  
Art Unit 2177

Debbie Le

May 13, 2004.



GRETA ROBINSON  
PRIMARY EXAMINER